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EXAMINER

HA, NGUYEN T

ART UNIT PAPER NUMBER

2831

DATE MAILED: 05/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/614,418

Applicant(s)

BASCERI ET AL.

Examiner

Nguyen T Ha

Art Unit

2831

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6-11 is/are allowed.
- 6) ☒ Claim(s) 1-5 and 12-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Allowable Subject Matter

1. The indicated allowability of claims 1-5, 7, 13 and 15-16 are withdrawn in view of the newly discovered reference(s). The rejections based on the newly cited reference(s) follow.

Response to Arguments

2. Applicant's arguments with respect to claims 6, 8-12, 14 and 17-19 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

3. Claims 32-39 are objected to because of the following informalities:

Claims 32-39, line 1, "claim 32 ". It is suggestion to change to - - claim 31 - -.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 12, 13, 15, 17, 25, 27, 29 and 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Farooq et al. (US 6,339,527).

Regarding claim 12, Farooq et al. disclose a capacitor structure (figures 1-2) comprising:

- a base layer/substrate (10);
- a bottom electrode (14) formed over the base layer;
- a first nucleation layer (18) consisting essentially of a metal formed over the bottom electrode;
- a BST film (20) formed over the first nucleation layer, (the barium strontium titanate or BST is an crystal); and
- a top electrode (26) formed over the BST film.

Regarding claim 13, Farooq et al. disclose the first nucleation layer is a material selected from the group consisting of Ti (column 2, line 14).

Regarding claim 15, Farooq et al. further disclose a second nucleation layer (12) between the base layer (10) and the bottom electrode (14).

Regarding claim 17, Farooq et al. disclose the base layer/substrate comprises polysilicon/glass ceramic substrate (column 1, line 67).

Regarding claim 25, Farooq et al. disclose a capacitor structure (figures 1-2) comprising:

- a base layer/substrate (10);
- a bottom electrode (14) formed over the base layer;
- a first nucleation layer (18) made of a metal formed over the bottom electrode, the first nucleation layer being a material selected from the group consisting of Ti (column 2, line 14);

- a BST film (20) formed over the first nucleation layer (the barium strontium titanate or BST is an crystal); and
- a top electrode (26) formed over the BST film.

Regarding claim 27, Farooq et al. further disclose a second nucleation layer (12) between the base layer and the bottom electrode.

Regarding claim 29, Farooq et al. disclose the base layer comprises polysilicon/glass ceramic (column 1, line 67).

Regarding claim 31, Farooq et al. disclose a capacitor structure (figures 1-2) comprising:

- a base layer/substrate (10);
- a bottom electrode (14) formed over the base layer;
- a first nucleation layer (18) made of a metal formed over the bottom electrode;
- a second nucleation layer (12) between the base layer and the bottom electrode;
- a BST film (20) formed over the first nucleation layer (the barium strontium titanate or BST is an crystal); and
- a top electrode (26) formed over the BST film.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-3, 14, 26 and 36-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farooq et al. (US 6,339,527) in view of Baum et al. (US 5,919,522).

Regarding claim 1, Farooq et al. disclose a capacitor structure (figures 1-2) comprising:

- a base layer/substrate (10);
- a bottom electrode (14) formed over the base layer;
- a BST film (20) formed over the bottom electrode (the barium strontium titanate or BST is a crystal); and
- a top electrode (26) formed over the BST film.

Farooq et al. is silent on the atomic percent titanium in the BST film.

Baum et al. teach the use of an atomic percent of 51% titanium in BST films in order to obtain a good dielectric constant and acceptable current leakage values (column 15, lines 16-37).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the deposition process and the 51% atomic weight titanium as taught by Baun et al. in the BST film of Farooq et al. in order to maintain a high degree performance for Farooq et al's capacitor.

Regarding claim 2, note that the teaching of Baum et al. falls within the claimed range.

Regarding claim 3, Farooq et al. disclose the base layer comprising polysilicon/glass ceramic substrate (column 1, line 67).

Regarding claim 14, Farooq et al. disclose all the claimed limitations discussed above with respect to claim 12, except for the BST film comprises about 52-53 atomic percent titanium.

Baum et al. teach BST film comprise 51% atomic percent titanium (column 15, lines 16-37, which is within the claimed range).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the deposition process and the 50 and 53% atomic weight titanium as taught by Baun et al. in the BST film of Farooq et al. in order to maintain a high degree performance for Farooq et al's capacitor.

Regarding claim 26, Farooq et al. disclose all the claimed limitations discussed above with respect to claim 25. Farooq et al. is silent on the atomic percent titanium in the BST film.

Baum et al. teach the use of an atomic percent of 51% titanium in BST films in order to obtain a good dielectric constant and acceptable current leakage values (column 15, lines 16-37).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the deposition process and the 51% atomic weight titanium as taught by Baun et al. in the BST film of Farooq et al. in order to maintain a high degree performance for Farooq et al's capacitor.

Regarding claim 36, Farooq et al. disclose a capacitor structure (figures 1-2) comprising:

- a base layer/substrate (10);
- a bottom electrode (14) formed over the base layer;
- a BST film (20) formed over the bottom electrode (the barium strontium titanate or BST is an crystal); and
- a top electrode (26) formed over the BST film.

Farooq et al. is silent on the atomic percent titanium in the BST film.

Baum et al. teach the use of an atomic percent of 51% titanium in BST films in order to obtain a good dielectric constant and acceptable current leakage values (column 15, lines 16-37).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the deposition process and the 51% atomic weight titanium as taught by Baun et al. in the BST film of Farooq et al. in order to maintain a high degree performance for Farooq et al's capacitor.

Regarding claim 37, note that the teaching of Baum et al. falls within the claimed range.

Regarding claim 38, Farooq et al. disclose the base layer comprising polysilicon/glass ceramic substrate (column 1, line 67).

8. Claims 4-5 and 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farooq et al. (US 6,339,527) in view of Baum et al. (US 5,919,522) as applied to claims 1 and 36 above, and further in view of Azuma (US 5,822,175).

Regarding claims 4 & 5, Farooq et al. modified as taught by Baum et al. has all the claimed limitations except for the bottom electrode (claim 4) or the top electrode (claim 5) being selected from the group of materials consisting of Pt, Ru, Ir, IrOx, RuOx, Pt-Rh, Mo, and Pd.

Azuma teaches an electrode being selected from a group of materials including Platinum due to their superior conductivity (see column 4, lines 23-61).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Platinum in either the bottom electrode or the top electrode of Farooq et al. in order to increase their conductivity in view of the teaching of Azuma.

Regarding claims 39 & 40, Farooq et al. modified as taught by Baum et al. has all the claimed limitations except for the bottom electrode (claim 4) or the top electrode (claim 5) being selected from the group of materials consisting of Pt, Ru, Ir, IrOx, RuOx, Pt-Rh, Mo, and Pd.

Azuma teaches an electrode being selected from a group of materials including Platinum due to their superior conductivity (see column 4, lines 23-61).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Platinum in either the bottom electrode or the top electrode of Farooq et al. in order to increase their conductivity in view of the teaching of Azuma.

9. Claims 16, 20-22, 28 and 32-33 rejected under 35 U.S.C. 103(a) as being unpatentable over Farooq et al. (US 6,339,527) in view of Fujii et al. (US 5,406,445).

Regarding claim 16, Farooq et al. disclose all the claimed limitations discussed above with respect to claims 12 & 15, except for the second nucleation layer is made of NiO.

Fujii et al. teach a first NiO (column 4, lines 57-58).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the NiO of Fujii substituted into Farooq in order to provide good conductivity for the capacitor.

Regarding claim 20, Farooq et al. disclose a capacitor figures 1-2 comprising:

- a base layer/substrate (10);
- a first nucleation layer (12) formed over the base layer;
- a bottom electrode (14) formed over the nucleation layer;
- a second nucleation layer/barrier layer (18) formed over the bottom electrode;
- a BST film (20) formed over the second nucleation layer (the barium strontium titanate or BST is an crystal); and
- a top electrode (26) formed over the BST film.

Farooq et al. lack the first nucleation layer made of NiO.

Fujii et al. teach a first NiO (column 4, lines 57-58).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the NiO of Fujii substituted into Farooq in order to provide good conductivity for the capacitor.

Regarding claim 21, the teaching of Fujii et al. further teach the bottom electrode being made of Platinum (column 4, lines 56-57).

Regarding claim 22, Farooq et al. disclose the second nucleation layer being made of a material selected from a group including platinum (column 2, line 14).

Regarding claim 28, Farooq et al. disclose all the claimed limitations discussed above with respect to claims 25 & 27, except for the second nucleation layer is made of NiO.

Fujii et al. teach a first NiO (column 4, lines 57-58).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the NiO of Fujii substituted into Farooq in order to provide good conductivity for the capacitor.

Regarding claim 32, Farooq et al. disclose all the claimed limitations discussed above with respect to claim 31, except for the second nucleation layer is made of NiO.

Fujii et al. teach a first NiO (column 4, lines 57-58).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the NiO of Fujii substituted into Farooq in order to provide good conductivity for the capacitor.

Regarding claim 33, Farooq et al. disclose the first nucleation layer is a material selected from the group consisting of Ti (column 2, line 14).

10. Claims 24 and 34 rejected under 35 U.S.C. 103(a) as being unpatentable over Farooq et al. (US 6,339,527) in view of Fujii et al. (US 5,406,445) as applied in claims 20 and 32 above, and further in view of Baum et al. (US 5,919,522).

Regarding claim 24, the teaching of Farooq et al. in view of Fujii includes all the claimed limitations discussed above with respect to claim 20. Farooq et al. is silent on the atomic percent titanium in the BST film.

Baum et al. teach the use of an atomic percent of 51% titanium in BST films in order to obtain a good dielectric constant and acceptable current leakage values (column 15, lines 16-37).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the deposition process and the 51% atomic weight titanium as taught by Baun et al. in the BST film of Farooq et al. in view of Fujii in order to maintain a high degree performance for Farooq et al's capacitor.

Regarding claim 34, the teaching of Farooq et al. in view of Fujii includes all the claimed limitations discussed above with respect to claim 32. Farooq et al. is silent on the atomic percent titanium in the BST film.

Baum et al. teach the use of an atomic percent of 51% titanium in BST films in order to obtain a good dielectric constant and acceptable current leakage values (column 15, lines 16-37).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the deposition process and the 51% atomic weight titanium as taught by Baun et al. in the BST film of Farooq et al. in view of Fujii in order to maintain a high degree performance for Farooq et al's capacitor.

11. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Farooq et al. (US 6,339,527) in view of Fujii et al. (US 5,406,445) as applied in claim 32 above, and further in view of Azuma (US 5,822,175).

Regarding claim 35, Farooq et al. disclose all the claimed limitations with respect to claim 31, except for the bottom electrode and the top electrode being selected from the group of materials consisting of Pt, Ru, Ir, IrOx, RuOx, Pt-Rh, Mo, and Pd.

Azuma teaches an electrode being selected from a group of materials including Platinum due to their superior conductivity (see column 4, lines 23-61).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Platinum in either the bottom electrode or the top electrode of Farooq et al. in order to increase their conductivity in view of the teaching of Azuma.

12. Claims 18-19, 23 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Farooq et al. (US 6,339,527) in view of Azuma (US 5,822,175).

Regarding claims 18 & 19, Farooq et al. disclose all the claimed limitations except for the bottom electrode (claim 18) or the top electrode (claim 19) being selected from the group of materials consisting of Pt, Ru, Ir, IrOx, RuOx, Pt-Rh, Mo, and Pd.

Azuma teaches an electrode being selected from a group of materials including Platinum due to their superior conductivity (see column 4, lines 23-61).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Platinum in either the bottom electrode or the top electrode of Farooq et al. in order to increase their conductivity in view of the teaching of Azuma.

Regarding claim 23, Farooq et al. disclose all the claimed limitations with respect to claim 20, except for the bottom electrode and the top electrode being selected from the group of materials consisting of Pt, Ru, Ir, IrOx, RuOx, Pt-Rh, Mo, and Pd.

Azuma teaches an electrode being selected from a group of materials including Platinum due to their superior conductivity (see column 4, lines 23-61).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Platinum in either the bottom electrode or the top electrode of Farooq et al. in order to increase their conductivity in view of the teaching of Azuma.

Regarding claim 30, Farooq et al. disclose all the claimed limitations with respect to claim 25, except for the bottom electrode and the top electrode being selected from the group of materials consisting of Pt, Ru, Ir, IrOx, RuOx, Pt-Rh, Mo, and Pd.

Azuma teaches an electrode being selected from a group of materials including Platinum due to their superior conductivity (see column 4, lines 23-61).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Platinum in either the bottom electrode or the top electrode of Farooq et al. in order to increase their conductivity in view of the teaching of Azuma.

Allowable Subject Matter

11. Claims 6-11 are allowed.

The following is an examiner's statement of reasons for allowance:

With respect to claims 6-11, the prior art alone or in combination does not teach the limitation of a first nucleation layer formed over the base layer and selected to induce a substantially uniform crystal orientation in subsequent layers formed thereon.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nguyen T Ha whose telephone number is 571-272-1974. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dean Reichard can be reached on 571-272-2800 ext. 31. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

Art Unit: 2831

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nguyen T. Ha
May 4, 2004

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